

WHAT IS CLAIMED IS:

1. A photomask comprising:
a transparent substrate;
a semitransparent film or shading film provided on the transparent
5 substrate;
a clear defect portion being a missing portion of a complete pattern
that should be formed when it is assumed that the semitransparent film or
shading film is completely well formed;
a shading portion, having a transmissivity of 0 to 2% or 2 to 6%,
10 provided in the clear defect portion; and
a semitransparent portion, formed at the peripheral portion of the
shading portion, having a transmissivity larger than that of said shading
portion.
2. The photomask according to claim 1, wherein
said semitransparent portion is formed to extend from an area inside
the outer peripheral line of said complete pattern to an area outside it when
said shading portion is viewed from the direction perpendicular to a main
5 surface of said transparent substrate.
3. The photomask according to claim 1, wherein
said semitransparent portion includes plural kinds of portions having
different transmissivities.
4. A method for producing the photomask according to claim 1,
wherein
said shading portion is a first deposition film deposited by FIB
radiation,
5 said semitransparent portion is a second deposition film deposited by
FIB radiation and having a film thickness smaller than that of said first
deposition film.

5. A method for producing the photomask according to claim 1,
wherein

said semitransparent portion is formed by implanting metal ions into
said transparent substrate by FIB radiation.

6. The method for producing the photomask according to claim 5,
wherein

said semitransparent portion is formed by etching said transparent
substrate with said FIB radiation.

7. The method for producing the photomask according to claim 6,
wherein

5 conditions for said FIB radiation are set in such a manner that the
etching depth d of said semitransparent portion by said FIB radiation is
substantially a value even-number times larger than $d = \lambda/2(n - 1)$, where λ
is the exposure wave length and n is the refraction index of the transparent
substrate.

8. The method for producing the photomask according to claim 5,
wherein

5 said FIB radiation is performed in a chamber (1000), and
when said semitransparent portion is formed by metal ion
implantation using said FIB radiation, gas for suppressing the etching of
said transparent substrate is introduced into atmosphere in said chamber.

9. A method for producing the photomask according to claim 1,
wherein

said semitransparent portion or shading portion is formed by using
FIB radiation to roughen the surface of said transparent substrate.

10. A method for producing the photomask according to claim 1,
wherein

said shading portion is a first deposition film deposited by laser CVD,

and

5 said semitransparent portion is a second deposition film deposited by laser CVD and having a second film thickness smaller than that of said first deposition film.

11. A defect correcting apparatus for correcting a clear defect in a photomask wherein a semitransparent film or first shading film is formed on a transparent substrate, comprising:

5 a detector for detecting the location, shape and dimension of a pattern of said semitransparent film or said first shading film;

 comparing means for comparing the pattern detected by the detector with an imaginary pattern that should be formed when it is assumed that a pattern which should be originally formed is completely formed;

10 a radiation source for radiating a focused ion beam or laser beam to an area necessary for correcting said clear defect portion generated in said pattern, the area being recognized on the basis of comparative results from the comparing means;

15 a gas supplying mechanism for supplying, into said clear defect portion, gas for depositing a second shading film having a transmissivity of almost 0 to 2% or 2 to 6%; and

 control means for controlling a location where said focused ion beam or laser beam is radiated onto said photomask, wherein

20 the control means has therein a program for carrying out a control for radiating said focused ion beam or laser beam onto said transparent substrate in such a manner that after the deposition of said second shading film, a semitransparent portion having a larger transmissivity than said second shading film is formed in the peripheral portion of the second shading film.